The Influence of Demographic and Socioeconomic Factors on the Appropriate Use of Aspirin Therapy

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Abstract

Existing research has shown aspirin therapy to be an effective preventive measure for cardiovascular disease in both individuals who have experienced a previous cardiovascular event and in those that are at an elevated risk to do so. Both the American Heart Association and the United States Preventive Services Task Force have recommended regular aspirin therapy for all individuals with existing cardiovascular disease, as well as individuals who present an elevated risk for a future cardiovascular event. However, existing research suggests that the actual use of aspirin as a preventive treatment is alarmingly low, and may be affected by age, race, gender, and socioeconomic status. In this study, the influence of demographic and socioeconomic factors on the effective use of aspirin as a preventive treatment for cardiovascular disease was examined. Results suggest that while women and younger individuals do use daily aspirin to a lesser extent, they are actually more likely to follow the proper course of preventive action according to established guidelines. Race and income influenced the use of aspirin therapy to a lesser extent than in other studies, and this lends support to the theory that quality of medical care is a source of the socioeconomic difference in preventive medicine. Results identify specific groups of individuals that may benefit from aspirin intervention and education programs.

The Influence of Demographic and Socioeconomic Factors on the Appropriate Use of Aspirin Therapy

The use of aspirin therapy in the prevention of cardiovascular disease has been shown to be an effective and beneficial treatment (Berger et al. 2006). For individuals with existing cardiovascular disease, aspirin therapy used as secondary prevention has been shown to reduce the reoccurrence of strokes and myocardial infarction by 30%, while also reducing all-cause mortality by 18% (Weisman and Graham 2002). It has been shown to significantly decrease the occurrence of myocardial infarction in men and the occurrence of ischemic stroke in women, with effectiveness of treatment increasing with age. Aspirin therapy is one of the more affordable preventive treatments available, and shows great benefit when compared to possible risks (Greving et al. 2008). The American Heart Association and American College of Cardiology recommends that all individuals with existing cardiovascular disease take a low-dose (75-162mg) aspirin daily for prevention of future cardiovascular events (Smith et al. 2006). While the use of aspirin for primary prevention of cardiovascular disease is less common than for secondary prevention, research supports the use of aspirin for both types of prevention. Studies have demonstrated that benefits of a reduction in myocardial infarction and stroke outweigh the small chance of non-fatal internal bleeding for primary prevention individuals at medium or high risk for cardiovascular

disease (Weisman and Graham 2002). And yet, people are not utilizing this cost-effective and evidence-backed method of cardiovascular disease prevention.

Research suggests that many doctors may not be aware of the proven benefits of aspirin therapy or may be wary of its side effects (Stafford and Radley 2002). Higher-income individuals are more likely to receive care at academic medical centers practicing evidence-based medicine, and patients at academic medical centers are more likely to receive aspirin therapy during inpatient care followed by a recommendation to continue therapy after discharge (Rao et al. 2004). The socioeconomic divide in access to quality healthcare may influence the use of aspirin in lower-SES individuals. Many may incorrectly assume that aspirin therapy is effective only for men, even though research has demonstrated significant benefit for both men and women (Greving et al. 2008). With regard to race, African Americans have been shown to have far greater short-term and long-term mortality rates after acute myocardial infarction, but are using aspirin therapy much less than white persons (Rao et al. 2004). Age has also been shown to be an important factor in the effectiveness of aspirin therapy; the older the individual, the more effective aspirin therapy is for the reduction of cardiovascular events (Greving et al. 2008). Aspirin therapy is less likely to be used by women, younger individuals, low-income and low-educated individuals, and non-white persons (Rolka et al. 2001). Many of these demographic and socioeconomic factors are interrelated and may be explained through the Health Belief Model (NCI 2005). This model is based on the idea that a person will engage in preventive medicine only after passing through a

certain criteria of action. The purpose of this study is to explore how differences in socioeconomic and demographic factors affect an individual's appropriate use of aspirin therapy. This study aims to explore the relationships between age, gender, race, income, and education that determine an individual's use of prescribed and appropriate (following established guidelines of use) aspirin therapy, and possible causal mechanisms of existing socioeconomic or demographic differences through the Health Belief Model.

Benefits and Risks of Aspirin Therapy

The benefits of aspirin therapy for individuals with existing cardiovascular disease are well accepted. In a meta-analysis of six clinical trials, Weisman and Graham (2002) found a statistically significant reduction of all-cause mortality of 18% for individuals using daily aspirin therapy. The results also showed a reduction in the frequency of vascular events and myocardial infarction by 30% (Weisman and Graham 2002). This benefit seemed to be present at very low doses of aspirin (30-75 mg/day), and the effectiveness of treatment remained the same with higher dosages (Hopkins and Limacher 2008). The risk of gastrointestinal bleeding, however, did increase with dose by a factor of 1.5 to 2.0 during the use of aspirin therapy (Persell and Baker 2004). Gastrointestinal bleeding was still rare (only 58 cases reported out of 6300 total participants), and there were no deaths reported (Weisman and Graham 2002).

Hopkins and Limacher (2008) estimated that approximately 10% of the population may be intolerant to aspirin due to an allergic reaction or other upper-respiratory problems. For secondary prevention, the benefits clearly outweigh the risks, and for these reasons the American Heart Association and American College of Cardiology recommended all secondary prevention individuals to follow a low-dose aspirin regimen (Smith et al 2006).

The benefits of aspirin use for primary cardiovascular prevention, however, have only recently been demonstrated consistently. As a result, secondary prevention individuals were found to be 4.3 times more likely to use aspirin therapy than primary prevention individuals (Rolka et al 2001). A meta-analysis of six trials exploring aspirin use in primary cardiovascular prevention found that aspirin significantly reduced the risk of a cardiovascular event, but also increased the likelihood of non-fatal gastrointestinal bleeding (Berger et al, 2006). After assessing benefits against risks, Greving et al (2008) concluded that aspirin therapy was beneficial for all men over 55 years old, as well as for women 55 years or older who have several risk factors for cardiovascular disease. While the benefits of aspirin therapy in primary prevention may not outweigh the risks of serious bleeding events for all individuals, research supports that a great deal of primary prevention individuals may benefit from it. In 2009, the United States Preventive Services Task Force recommended that primary prevention individuals, including men age 45-79 and women age 55-79 with a cardiovascular disease risk that outweighs the risk of serious bleeding events, follow an aspirin regimen (USPSTF 2009). These

guidelines have specific risk thresholds for each age and gender category, and can be found in Figure 1.

Theoretical Framework

The Health Belief Model is very useful in exploring the existing divides along socioeconomic lines in effective aspirin use. It contains a series of six criteria that must be fulfilled for an individual to take preventive action (NCI 2005). The six criteria are a *perceived susceptibility* (beliefs that a person may contract a condition), *perceived severity* (beliefs that a condition would have serious or harmful effects), *perceived benefits* (belief that taking preventive action would reduce chance of contracting condition or its effects), *perceived barriers* (belief that costs of preventive measures are less than perceived benefits), *cues for action* (exposure to a stimulus for taking action), and *self-efficacy* (confidence in one's ability to take action) (NCI 2005). These categories can also be found in Figure 2. This model provides potential reasons why demographic or socioeconomic factors may limit certain groups of people from taking preventive action against cardiovascular disease in the form of aspirin therapy.

Gender Disparities

One of the main existing disparities in aspirin use is between men and women. Existing research suggests that aspirin may operate in different ways for men and women, resulting in different treatment patterns and benefits for each. Previously, it was believed that aspirin therapy was less effective for women than men. The primary biological role of aspirin for cardiovascular prevention is to inhibit platelet aggregation in blood by acetylating COX-1 and halting a conversion to a platelet activator (Becker et al. 2006). A study by Becker et al (2006) examined the platelet reactivity in both men and women on aspirin therapy. The study found that while women had higher initial platelet reactivity, they actually received a greater platelet activity reduction than men, with final levels of activity only slightly higher than men's. More importantly, both men and women had near complete suppression of the COX-1 pathway, suggesting that aspirin therapy may be just as effective biologically for women as it is for men (Becker et al. 2006).

Research into the clinical results of aspirin therapy support the findings of positive outcomes for both genders, but the specific benefits differ. Berger et al (2006) found through a meta-analysis of six aspirin trials that men and women both received measureable benefit from aspirin therapy as demonstrated by an overall reduction of cardiovascular events. While men had a reduced risk of myocardial infarction, woman had a lower risk of ischemic stroke during aspirin therapy. There was no reduction in

the risk of myocardial infarction for women or ischemic stroke for men. A study by Hopkins and Limacher (2008) supported these findings of reduced myocardial infarction in men and ischemic stroke in women. Aspirin therapy has also been shown to reduce the risk of colorectal cancer in women, and long-term use even shows a moderate reduction in death from lung and breast cancer in women (Chan et al. 2007). Research suggests that aspirin therapy is cost-effective for men with a cardiovascular disease risk of greater than 10%, and women with a cardiovascular disease risk of greater than 15% (Greving et al. 2008). Men reach these cardiovascular disease risk thresholds at an earlier age, so it becomes clear that a differential prescription pattern is necessary for aspirin treatment between genders (Murasko 2006).

Research demonstrates the benefits of aspirin therapy for both men and women, yet a large gap exists in its use. Multiple studies have shown that men use aspirin therapy at a far greater rate than women for primary and secondary prevention (Cho et al. 2008; Rolka et al. 2001; Persell and Baker 2004). Some of these differences may be due to the normal prescription pattern of aspirin; women develop cardiovascular disease at later ages than men (Murasko 2006). The greater frequency of aspirin resistance found among women may be another factor in this disparity (Berger et al. 2006). Access to health insurance has also been shown to have a greater impact on women's rates of preventive screenings and physician contact than men's (Murasko 2006). A study by Mosca et al (1998) suggests that men and women have different lifestyle barriers in cardiovascular disease prevention. Time was the largest barrier to

preventive medicine for men, and self-esteem was the largest barrier for women. The Health Belief Model criterion suggests the general population may not be aware of the latest research that demonstrates the benefits of aspirin therapy for women and may not believe that women would get the same benefits as men (*lack of perceived benefits*). Also, non-evidence-based practitioners may not be as knowledgeable of current research in aspirin therapy, and may be less likely to prescribe aspirin therapy (*cues to action*). Women are more likely to have a lower income than men, and lower-income individuals are more likely to go to non-evidence based practices, so the trend of the under-prescription of aspirin between genders may be explained by these factors (Rao et al. 2004).

Age Disparities

Age is associated with gender in determining the effectiveness of aspirin therapy. For primary prevention individuals, aspirin therapy has been shown to be effective for all men 55 years or older, due to the prevalence of cardiovascular risk factors at that age (Greving et al. 2008). Women encounter these risk factors at later ages on average, and aspirin therapy has been shown to be effective only for women 55 years or older who also present with multiple risk factors for cardiovascular disease, such as smoking, family history of cardiovascular disease, diabetes, hypertension, or high cholesterol (Greving et al. 2008; Hopkins and Limacher 2008). In both genders,

greater age increases the prevalence of cardiovascular disease risks, and therefore the potential effectiveness of aspirin therapy.

Younger individuals have been shown to be much less likely to use aspirin therapy than older individuals (Rolka et al. 2001). Sociological research suggests that the primary disparity in aspirin use may be among young men, despite the infrequent prescription of aspirin for primary prevention among young women. Studies suggest that men are less likely to engage in help-seeking behavior, and are less likely to go to doctor's offices when sick compared to women (Galdas et al. 2005). This behavior may lead to fewer recommendations for aspirin therapy by physicians for younger men with multiple risk factors, because fewer trips to the doctor may result in fewer *cues for action*. Also, research suggests that socialized masculinity in men leads to a stronger belief of immunity to disease or injury, as reflected in men's tendency to engage in much more high-risk behaviors than women (Cherpitel and Ye 2008). The Health Belief Model criterion suggests that younger men may believe that they are less susceptible to disease (*perceived susceptibility*).

Socioeconomic Disparities

Income level and education may influence the use of aspirin therapy, with lower-income and lower-educated individuals using aspirin at a lower rate than the rest of the population (Rolka et al. 2001). Individuals with lower incomes have a much greater all-

cause mortality rate after discharge from an acute myocardial infarction, both short and long term (Tonne et al. 2005). This result was consistent for both individual income levels and individuals living in overall lower-income neighborhoods (Tonne et al. 2005). Those with less education were also found to have greater all-cause mortality after a myocardial infarction (Gerber et al. 2008). Lower-income individuals were found to present with cardiac disease symptoms later, were less likely to receive evidence-based medicine, and were less likely to receive aspirin therapy while hospitalized or receive a recommendation to use aspirin after discharge (Rao et al. 2004). Higher-income individuals were more likely to be admitted to teaching hospitals where evidence-based medicine was practiced, and were more likely to receive recommendations for aspirin therapy upon discharge. Another disparity in quality of care through socioeconomic status was found in smoking cessation rates. Although low-SES individuals were found to have higher rates of smoking (a cardiovascular risk factor), they often received less in-patient smoking cessation counseling than high-SES individuals (Rao et al. 2004).

From existing evidence, the primary disparity in aspirin use among socioeconomic status levels seems to be the quality of hospital care and lack of evidence-based medicine available to low-SES individuals. Some may point to an inability to afford aspirin therapy, but this has not been demonstrated in clinical studies. Aspirin therapy can be quite affordable, costing as low as $1.50 per month; this should not provide a large barrier to low-SES individuals who wish to engage in preventive aspirin therapy (Rolka et al. 2001). Since physicians in non-evidence-based medicine

practices may be less knowledgeable of current aspirin research, they may be less likely to prescribe it based on outdated concerns about its effectiveness (Stafford and Radley 2003), which may lead to less prescribing of aspirin therapy to low-SES individuals (*less cues for action*). Moreover, lower-income individuals have generally poorer overall health, and may feel they do not have as much control over their health as those with higher-incomes. Due to this, lower-income individuals may not feel aspirin therapy would be effective in preventing disease (*perceived benefits*). A study by Link, Northridge, Phelan, et al. (1998) lends support to this theory. They found that women with higher levels of income and education were more likely to use preventive screening such as pap smears and mammograms. They argue in their fundamental cause of disease theory that socioeconomic status is the fundamental cause of risk factors associated with disease, and prevails in all societies. Socioeconomic status may inhibit preventive action through the quality of medical care available to low-SES individuals.

Racial Disparities

Race is also an important factor in assessing population health and preventive medicine effectiveness. African Americans have much higher short- and long-term mortality rates after the occurrence of a myocardial infarction compared to other racial groups, regardless of income or education level (Rao et al. 2004). African Americans are especially affected by strokes, and aspirin therapy has shown to significantly reduce the

frequency of ischemic stroke (Gorelick et al. 2003). White persons, however, are 2.5 times more likely to follow an aspirin regimen than African Americans (Rolka et al. 2001). To explain this difference, Underwood (1992) evaluated preventive cancer behaviors in black men, and found that there was a high degree of "learned helplessness"; black men felt that the high-risk behaviors in which they engaged did not have a bearing on their risk for disease and that they were helpless to change their individual disease outcomes. The Health Belief Model criterion of *perceived benefits* may explain why; they do not feel that taking preventive action would lessen the chance of contracting a disease or condition.

Summary

Research suggests that many of these demographic and socioeconomic characteristics are interrelated, so assessing these factors together may offer insight into the discrepancies in aspirin use for cardiovascular prevention. Studies have demonstrated that low-SES individuals were more likely to be women, black, younger, and have more cardiovascular risk factors present than high-SES individuals (Rao et al. 2004). Trends in aspirin therapy show that individuals who were women, younger, black or low -SES were all much less likely to follow an aspirin regimen (Rolka et al. 2001).

The combination of these demographic factors may influence the quality of medical care, and a perception of fewer benefits from aspirin therapy. Research

suggests that a lack of perceived benefits and lack of cues for action may account for differences in aspirin use along socioeconomic and demographic lines. The lack of perceived benefits may lead to an inaccurate perception of an individual's actual cardiac risk. This study aims to explore how these demographic trends are related to effective and appropriate use of aspirin, and to determine specific groups that may benefit from social programs that would educate and encourage the use of aspirin therapy.

Methods

This study was approved by the Ohio State University Biomedical Institutional Review Board. Survey methods of data collection were used to assess cardiovascular risk in a primary care practice population. The sample population was the family practice patients of the Ohio State University Primary Care Network located around the Columbus city area and surrounding communities. This population was chosen because the prescription of aspirin therapy usually occurs during preventive medical care, which occurs most frequently in the primary care setting. The survey contained a variety of questions about cardiovascular risk factors (smoking status, family history, diabetes, hypertension, high cholesterol, kidney disease), aspirin use (frequency, dosage, reasons for following/not following an aspirin regimen, physician recommendation of aspirin), and demographic information (age, gender, ethnicity, race, level of education, income).

After participants completed the survey, clinical information (latest blood pressure, lipid profile, glucose level, hemoglobin A1c level, and C-reactive protein) was obtained from the participants' medical records to accurately calculate cardiovascular disease risk using the Framingham cardiovascular risk assessment tool. The surveys were distributed through a convenience sample to 50% of the incoming practice population in the waiting area. The target population was limited to adults 40 to 80 years of age. Individuals were excluded from the study if they could not read or comprehend English.

The surveys were administered from July through October 2008. After survey collection was complete, the data was entered into a computer database in March 2009, and the data was analyzed in April 2009. Descriptive statistics and cross-tabulations were performed in SPSS 17.0. Significance of correlations was tested with chi-squared analysis and Fisher's exact testing. The Framingham cardiovascular risk assessment tool was used to evaluate cardiovascular risk, and the clinical risk was categorized "*should take aspirin"* or "*should not take aspirin*" in accordance with USPSTF guidelines as listed in Figure 1 (USPSTF 2009). The demographic and socioeconomic data was compared to each of three dependent variables in cross-tabulation; *(1) daily aspirin use, (2) following a healthcare provider's recommendation for aspirin therapy,* and *(3) the appropriate use of aspirin therapy according to USPSTF guidelines*.

Results

Characteristics of Sample

There were 917 total surveys administered in the study. The breakdown of demographic characteristics mirrored the known population of the Ohio State primary care network. Of the respondents, 332 (36.2%) were men and 584 (63.7%) were women. The age of the respondents ranged from 40 to 80 years of age; the mean age was 54.8 years, while the median age was 54 years old. The racial distribution of respondents included 597 (65.1%) white respondents, and 251 (27.4%) black respondents. Due to a lack of respondents from other racial categories, only these two racial categories were used in data analysis. The median level of education for the sample was some college education, with 296 (32.3%) participants reporting an education of a high school degree or less, and 608 (66.3%) reporting an education of some college education or a college degree. The distribution of annual household income included 325 (35.4%) respondents reporting less than $24,000, while 530 (57.8%) respondents reported an annual household income of $24,000 or greater. The majority (562, 61.3%) of respondents reported private health insurance, while 127 (13.8%) respondents reported using Medicare, 173 (18.9%) used Medicaid or Care Source, and only 26 (2.8%) were self-pay or uninsured. The demographic characteristics of the sample can be found in Table 1.

Demographic and Socioeconomic Correlations to Aspirin Use

Demographic characteristics of the sample were first examined individually to determine their correlations to daily aspirin use. 358 (39.3%) of all respondents reported daily aspirin use. Men were found to be 8.2% more likely to use aspirin therapy than women ($p < 0.01$). Black respondents were 3.3% more likely to use daily aspirin therapy than white respondents but this was not statistically significant. Age correlated with daily aspirin use, with 63.9% of respondents age 65 to 80 reporting daily aspirin use compared to only 26.5% of respondents age 40 to 54 ($p < 0.01$). Respondents who did not receive a high school diploma used aspirin therapy least often (33.3%), but this was not statistically significant. Income level was significantly associated with daily aspirin use ($p < 0.01$). Respondents reporting annual household incomes of less than $24,000 were significantly more likely to use daily aspirin therapy (44.6%) than respondents with annual household incomes of $24,000 or more (35.9%). Health insurance was significantly associated with daily aspirin use; individuals on Medicare reported much higher rates of daily aspirin use (57.8%) than individuals on other forms of insurance.

Two other categories were also examined for daily aspirin use. The influence of prevention category (respondents with no history of cardiovascular disease were defined as primary prevention, and respondents with a history of CVD were defined as secondary prevention), and the respondent's perceived risk of having a heart attack or

stroke within ten years were both compared to daily aspirin use. Secondary prevention individuals were found to use aspirin therapy at a higher rate (64.5%) than primary prevention individuals (30.0%) ($p < 0.01$). Perception of risk also had a significant impact on an individual's use of aspirin therapy, with 47.7% of individuals reporting a perceived high risk taking aspirin compared to only 33.2% of individuals reporting a perceived low risk of cardiovascular event ($p < 0.01$). These findings and chi-squared values are summarized in Table 2.

Correlations to Provider's Recommendation for Aspirin Therapy

In further analysis, the reported daily use of aspirin was compared to the reported recommendation by the respondent's healthcare provider to follow or to not follow a daily aspirin regimen, as demonstrated in Table 3. 84.2% (691) of respondents were following the course recommended to them by their physician. These results were consistent between genders (84.1% of men; 84.2% of women), education levels (all categories were between 80.3% and 88.1%), and annual income levels (84.5% for respondents with an income of less than $24,000; 84.5% for respondents with an income of $24,000 or greater). White respondents followed their healthcare provider's recommendation at a higher rate (85.9%) than black respondents (79.9%) ($p < 0.05$). Younger respondents were more likely to follow a physician's recommendation ($p < 0.05$); 86.6% of individuals age 40 to 54 reported following a provider's

recommendation, while only 77.6% of respondents age 65 to 80 did so. Individuals with private insurance were more likely to follow a provider's recommendation (85.6%) than respondents who were on Medicaid (81.9%), Medicare (81.1%), or did not have medical insurance (78.3%). These differences, however, were not statistically significant. Prevention category or perceived risks of a cardiovascular event were not significantly associated with an individual's likelihood to follow physicians' recommendations for aspirin therapy.

Correlations to Appropriate Aspirin Use

The demographic and socioeconomic factors were compared to the appropriate use of aspirin therapy according to the United States Preventive Services Task Force recommendations for aspirin use (all secondary prevention individuals, all primary prevention individuals with a cardiovascular disease risk that outweighs the risk of serious bleeding events, as outlined in Figure 1). 63.1% of all respondents were found to be following USPSTF guidelines for appropriate aspirin use. Women (68.5%) follow these recommendations at a greater rate than men (54.2%) ($p < 0.01$). White respondents follow USPSTF guidelines (64.5%) more than black respondents (60.3%), although this difference was not statistically significant. Younger individuals follow USPSTF guidelines at a greater rate than older individuals, but this difference was not significant. Data suggests an association between higher education and USPSTF

guidelines compliance, but the results were not statistically significant. When the education categories were categorized as "*high school degree or less"* and "*some college / college degree*", respondents with a high school education or less (58.0%) followed USPSTF aspirin use guidelines at a significantly lower rate than individuals with some college or a college degree (66.5%) ($p < 0.05$). Respondents with an annual income of $24,000 or greater follow USPSTF guidelines at a higher rate (66.1%) than respondents with an annual income of less than $24,000 (62.0%), but this difference was not significant. There was no significant correlation in health insurance type to appropriate aspirin use. Secondary prevention respondents follow USPSTF guidelines (64.8%) more than secondary prevention respondents (62.4%), although this difference was not significant. A respondent's perceived risk of a cardiovascular event was not significantly associated with a respondent's compliance to USPSTF guidelines for aspirin use. These findings and chi-squared values are summarized in Table 4.

Discussion

Many of the findings from this study are consistent with many demographic and socioeconomic trends demonstrated in literature, but also produced some new and conflicting perspectives on the association between demographic and socioeconomic factors with aspirin use. Daily aspirin use was found to be significantly more common in men, older, and secondary prevention individuals, which was consistent with previous

literature (Rolka et al. 2001). However, prescribed aspirin use and appropriate use of aspirin according to USPSTF guidelines as additional dependent variables provided interesting contrasts to these findings.

With regard to gender, men were found to use aspirin at a higher rate than women, but both genders followed the recommendation of their health care provider at similar rates, and women were actually more likely to follow USPSTF guidelines for aspirin use. These results are represented in Figure 3. These findings suggest that while previous research focuses on the gender disparity in aspirin use, men may still benefit from increased education regarding aspirin use for cardioprevention. Women have been shown to develop significant cardiac risk at a later point in life than men, and men in general are at a higher risk of cardiovascular disease, a gender disparity in aspirin's use may be a logical conclusion (Greving et al. 2008). More importantly, women were more likely to follow established guidelines for aspirin use, which suggests that men are lagging behind women in cardiovascular disease prevention through aspirin use. The Health Belief Model criterion of cues to actions may help to explain this disparity. Generally, men have been found to be less likely to engage in help-seeking behaviors (Galdas et al. 2005). In a survey of family physicians, Tudiver and Talbot (1999) found that physicians believed men were much more indirect about the problems for which they came to visit their doctor. Men were also more likely to see their doctor for a specific problem, while women were more likely to come into the office for general health concerns, such as preventive medicine. This would result in fewer cues for

action, because men would be less likely to come into a visit for preventive concerns, or would be less direct about their preventive medicine concerns. These findings suggest that future research to evaluate potential problems that men have with establishing and confronting preventive medicine would be beneficial.

The study results of increasing use of aspirin with age are consistent with existing research; aspirin has been found to be more effective in preventing cardiovascular events with increasing age, and, on average, more cardiac risk factors are present with increasing age (Greving et al. 2008). This study revealed that younger individuals were more likely to follow the recommendation of their health care provider. Because of the prevalence of cardiac risk factors in the elderly, especially in elderly men, these findings highlight a major area of concern for preventive medicine. Older men have been shown to be the most at risk for a cardiovascular event, yet they have been shown to be the least likely to follow the proper course of action in aspirin therapy (Greving et al. 2008).

This study also revealed that respondents with an annual income of less than $24,000 were more likely to use daily aspirin therapy than individuals with an annual income of $24,000 or greater. This finding is opposite of the SES gradient in literature. This finding reinforces the affordability of aspirin as an affordable method of prevention, even for those with low incomes (Rolka et al. 2001). Previous research suggests that the disparity in aspirin use between income levels was due to the lack of evidence-based medicine and differences in quality of medical care. In this study, all respondents

surveyed were patients in the same network of evidence-based practices; perhaps the primary cause of the SES disparity of aspirin use was not present in this study population (Rao et al. 2004). Respondents with higher incomes were more likely to use aspirin therapy in accordance with USPSTF guidelines than lower income respondents, but this difference was not significant. Education was significantly associated with USPSTF guideline compliance but was not significantly associated with the use of aspirin therapy or the likelihood of following a health care provider's recommendation. Consistent with previous studies, respondents with a high school education or less were less likely to follow aspirin therapy guidelines than respondents with some college education or a college degree. When examining education and income together as a measure for socioeconomic status, findings suggest the absence of group differences, which may be the result of equitable health care quality provided through a primary care network utilizing evidence-based medicine. This result may support further research into the differences in quality of health care and preventive medicine in non-evidence-based medical care.

Racial disparities in aspirin use were also demonstrated, although they were not as pronounced as literature suggests. While black persons were more likely to use aspirin therapy, white persons were more likely to follow a healthcare provider's recommendation, and were more likely (although not statistically significant) to follow USPSTF guidelines. These findings support existing research which suggests African Americans may benefit from interventions to increase appropriate aspirin use (Rolka et

al. 2001). A possible explanation for the greater use of aspirin therapy by black persons is that the disparity exists through socioeconomic status, and subsequent use of non-evidence based medicine. Further comparison between racial groups while controlling for income levels may be useful in evaluating this explanation. The Health Belief Model criterion of perceived benefits of aspirin therapy may not have been demonstrated due to the "learned helplessness" in health prevention behaviors described by Underwood (1992).

Primary prevention respondents were less likely to follow an aspirin regimen than secondary respondents, but significant differences were not found in following a provider's recommendation or following USPSTF guidelines. This finding suggests that while many previous studies focused on the need to encourage aspirin use in primary prevention, more awareness for aspirin therapy is still necessary for both primary and secondary prevention. USPSTF guidelines recommend that 63.1% of the respondents follow a daily aspirin regimen, but only 39.3% reported using aspirin therapy. The benefits of aspirin in secondary prevention have been well-established, and the benefits for primary prevention have recently been demonstrated, so the lack of utilization of this treatment suggests an area of concern.

Perception of cardiovascular disease risk had a significant impact on the use of aspirin therapy. Respondents with a high perceived risk of cardiovascular disease were more likely to use aspirin therapy than respondents with a low perceived risk. While

limited research exists on the influence of perception of risk on the use of preventive medicine, this finding can be explained by the Health Belief Model. The greater a person's perceived risk of contracting a condition, the more likely they are to take preventive action. These findings support further research into the effect of perception of risk on preventive action.

The influence a healthcare provider can have over his/her patient and the ability to support preventive medicine was also demonstrated through this study. Respondents were more likely to follow a provider's recommendation than they were to be following USPSTF guidelines for aspirin use. Healthcare providers provide cues for preventative action, and can influence perceived benefits and risks by giving their patient research-backed information. Results suggest that healthcare providers may be able to close many demographic and socioeconomic disparities in aspirin use.

Limitations

Several factors were not accounted for in the data analysis. Many secondary prevention individuals may have not been on aspirin because they were on another medication to help thin their blood, or they were allergic to aspirin. While data for these occurrences was obtained, it was not factored into the analysis. Further examination of the data may provide insight into the lack of aspirin use by secondary prevention individuals. In addition, the survey was distributed as a convenience sample,

so there may have been inherent error in the sample population. Research suggests that many of the socioeconomic and demographic categories may be interrelated, so further analysis into specific correlations between these groups may provide more specific groups of individuals that could benefit from aspirin intervention programs (Rolka et al. 2001).

Conclusion

Aspirin therapy has been shown to be an effective treatment for the prevention of myocardial infarction in men and strokes in women, both for primary and secondary prevention. Yet, disparities exist in its use along demographic and socioeconomic lines. While previous research examined the use of aspirin and associated benefits, this study examined the use of aspirin compared to a healthcare provider's recommendation and its use in accordance to established guidelines. Findings in these categories suggest that while many researchers are focused on narrowing the disparities in aspirin use, all studied groups used aspirin therapy at a less-than-ideal rate. In particular, men used aspirin at a greater rate than women, but followed USPSTF guidelines for its use at a far lower rate. Both men and women may benefit from different types of intervention programs. The lack of large disparities in aspirin use among racial and socioeconomic categories as found in existing literature suggest that a primary source of socioeconomic disparities may lie in access to quality, evidence-based medical care. Respondents

followed the recommendation of their health care provider at a much greater rate than they followed the proper guidelines for use, suggesting that healthcare providers hold a vastly important role in the encouragement and use of aspirin therapy. Overall, disparities exist in daily aspirin use, treatment, and proper use, and data suggests that each of these factors may be important in determining the effective use of aspirin by individuals that may gain the most benefit from aspirin therapy.

Table 1: Demographic Characteristics of Respondents

Characteristic	**Frequency**	**%**	**Valid %[1]**
Total Surveyed	**917**	100	100
Gender			
Men	332	36.2	36.2
Women	584	63.7	63.8
Race			
White	597	65.1	70.4
Black	251	27.4	29.6
Age (years)			
40 - 54	486	53.0	53.0
55 - 64	282	30.8	30.8
65 - 80	149	16.2	16.2
Education			
11th Grade or Less	87	9.5	9.6
High School Graduate / GED	209	22.8	23.1
Some College	200	21.8	22.1
Associate's Degree	62	6.8	6.9
Bachelor's Degree	198	21.6	21.9
Master's Degree	148	16.1	16.4
Income			
Less than $15,000	214	23.3	25.0
$15,000 - $23,999	111	12.1	13.0
$24,000 - $49,999	219	23.9	25.6
$50,000 - $75,000	151	16.5	17.7
More than $75,000	160	17.4	18.7
Less than $24,000	325	35.4	38.0
$24,000 or Greater	530	57.8	62.0
Health Insurance			
Medicaid / Care Source	127	13.8	14.3
Medicare	173	18.9	19.5
Private Insurance	562	61.3	63.3
Self-Pay / None	26	2.8	2.9

1: Valid % removes missing data and characteristics not factored into calculations.

Table 2: Effect of Demographic and Socioeconomic Characteristics on the Use of Daily Aspirin Therapy

Characteristic	% Daily Aspirin Use (N)	X^2	P value
Total	**39.3 (358)**		
Gender			
Men	44.6 (146)	6.025	.009
Women	36.4 (212)		
Race			
White	38.3 (228)	.713	.221
Black	41.4 (103)		
Age (years)			
40 - 54	26.5 (128)		
55 - 64	48.4 (136)	80.351	< .0005
65 - 80	63.9 (94)		
Education			
11th Grade or Less	33.3 (29)		
High School Graduate / GED	44.2 (92)		
Some College	41.0 (82)	5.110	.403
Associate's Degree	41.9 (26)		
Bachelor's Degree	36.2 (71)		
Master's Degree	36.5 (54)		
Income			
Less than $24,000	44.6 (144)	6.318	.007
$24,000 or Greater	35.9 (190)		
Health Insurance			
Medicaid / Care Source	42.1 (53)		
Medicare	57.8 (100)	31.723	< .0005
Private Insurance	33.9 (190)		
Self-Pay / None	38.5 (10)		
Prevention Category			
Primary	30.0 (200)	89.161	< .0005
Secondary	64.5 (158)		
Perceived Risk[1]			
Low Risk (Less than 6%)	33.2 (125)		
Medium Risk (6% to 10%)	41.6 (150)	10.534	.005
High Risk (Greater than 10%)	47.7 (62)		

1: Respondent's perceived risk of having a heart attack or stroke within the next 10 years.

Table 3: Effect of Demographic and Socioeconomic Characteristics Following Provider Recommendation to Use / Not Use Aspirin Therapy

Characteristic	% Daily Aspirin Use (N)	X^2	P value
Total	**84.2 (691)**		
Gender			
Men	84.1 (243)	.001	.523
Women	84.2 (447)		
Race			
White	85.9 (474)	4.123	.029
Black	79.9 (171)		
Age (years)			
40 - 54	86.6 (374)		
55 - 64	83.5 (213)	6.276	.043
65 - 80	77.6 (104)		
Education			
11th Grade or Less	80.3 (61)		
High School Graduate / GED	84.7 (150)		
Some College	83.0 (151)	4.012	.548
Associate's Degree	80.0 (44)		
Bachelor's Degree	88.1 (163)		
Master's Degree	83.7 (118)		
Income			
Less than $24,000	84.5 (235)	.003	.522
$24,000 or Greater	84.4 (416)		
Health Insurance			
Medicaid / Care Source	81.9 (86)		
Medicare	81.1 (129)	2.904	.407
Private Insurance	85.6 (441)		
Self-Pay / None	78.3 (18)		
Prevention Category			
Primary	84.7 (511)	.568	.257
Secondary	82.6 (180)		
Perceived Risk[1]			
Low Risk (Less than 6%)	86.4 (293)		
Medium Risk (6% to 10%)	81.6 (266)	2.937	.230
High Risk (Greater than 10%)	83.2 (99)		

1: Respondent's perceived risk of having a heart attack or stroke within the next 10 years.

Table 4: Effect of Demographic and Socioeconomic Characteristics on the Appropriate Use of Daily Aspirin Therapy in Accordance with USPSTF Guidelines[2]

Characteristic	% Daily Aspirin Use (N)	X^2	P value
Total	**63.1 (491)**		
Gender			
Men	54.2 (160)	16.070	< .001
Women	68.5 (331)		
Race			
White	64.5 (324)	1.195	.156
Black	60.3 (132)		
Age (years)			
40 - 54	64.3 (250)		
55 - 64	61.5 (155)	0.508	.776
65 - 80	62.8 (86)		
Education			
11th Grade or Less	57.1 (44)		
High School Graduate / GED	58.4 (104)		
Some College	62.8 (108)	7.086	.214
Associate's Degree	66.7 (34)		
Bachelor's Degree	69.4 (120)		
Master's Degree	67.8 (80)		
High School Degree or Less	58.0 (148)	5.324	.013
Some College / College Degree	66.5 (342)		
Income			
Less than $24,000	62.0 (171)	1.275	.147
$24,000 or Greater	66.1 (300)		
Health Insurance			
Medicaid / Care Source	59.0 (62)		
Medicare	63.8 (95)	1.630	.653
Private Insurance	64.2 (312)		
Self-Pay / None	73.3 (11)		
Prevention Category			
Primary	62.4 (333)	.412	.288
Secondary	64.8 (158)		
Perceived Risk[1]			
Low Risk (Less than 6%)	62.5 (198)		
Medium Risk (6% to 10%)	65.0 (199)	.687	.709
High Risk (Greater than 10%)	61.3 (73)		

1: Respondent's perceived risk of having a heart attack or stroke within the next 10 years.
2: USPSTF Guidelines listed in Figure 1.

Figure 1: United States Preventative Services Task Force Guidelines for Primary Prevention Aspirin Therapy[1]

Men (age):	**10-Year CHD Risk[2]:**	**Women (age):**	**10-Year Stroke Risk:**
< 45 years	Do not take	< 55 years	Do not take
45-59 years	≥ 4% risk	55-59 years	≥ 3% risk
60-69 years	≥ 9% risk	60-69 years	≥ 8% risk
70-79 years	≥ 12% risk	70-79 years	≥ 11% risk

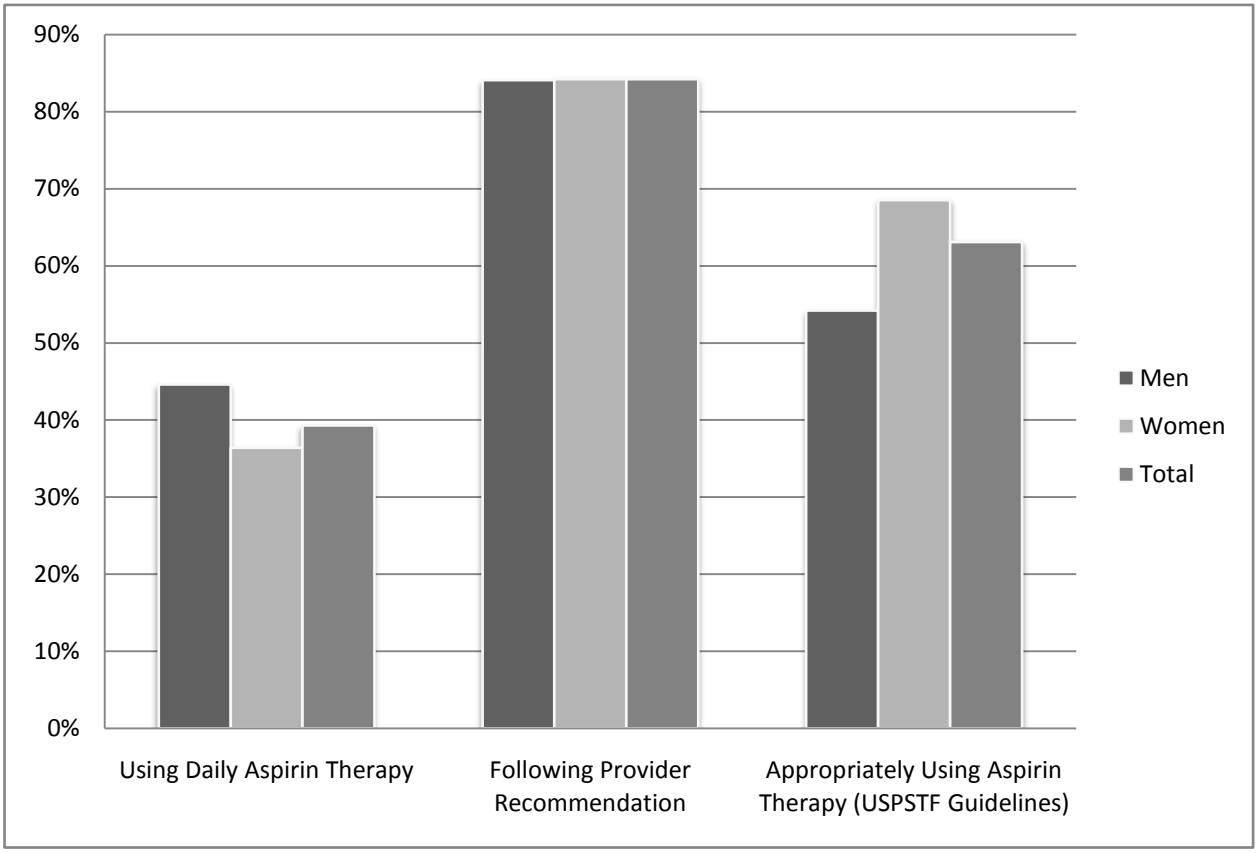
1: Guidelines indicate that all secondary prevention patients take daily aspirin.
2: CHD = Coronary Heart Disease. Percentage risks indicate the risk level at which the possible benefit of cardiovascular disease prevention balances with the risk of serious bleeding events. For purposes of study, CHD risk and stroke risk are approximated using Framingham risk assessment tool.

Figure 2: The Health Belief Model[1]

Concept:	Definition:
Perceived Susceptibility	Beliefs about the chances of getting a condition.
Perceived Severity	Beliefs about the seriousness of a condition and its consequences.
Perceived Benefits	Beliefs about the effectiveness of taking action to reduce risk or seriousness.
Perceived Barriers	Beliefs about the material and psychological costs of taking action.
Cues to Action	Factors that activate "readiness to change".
Self-efficacy	Confidence in one's ability to take action.

1: National Cancer Institute Publication, 2005.

Figure 3: Gender Differences in the Use of Aspirin Therapy[1,2,3]



1: Using daily aspirin therapy, $p = < 0.01$

2: Following provider recommendation, $p = 0.52$

3: Appropriately using aspirin therapy (USPSTF guidelines), $p = < 0.01$

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